

Patent claims

1. Method for load transfer in a container storage space for standard containers, with a stacker crane for the containers servicing the container storage space, controllable by a DP system of a logistical management, which can travel between a storage place for each container and a loading platform of a transport vehicle of a container that can travel in the area of the container storage space, wherein the stacker crane has a load suspension device for depositing the container on the loading platform, which can be oriented with respect to it,
characterized by the sequence of the following work steps when loading the transport vehicle:
 - a) the transport vehicle is identified and the data generated in this way are transmitted to the DP system of a logistical management,
 - b) by means of a calibrated camera system, defined identification points are detected on the loading platform of the transport vehicle and their coordinates are transmitted to the logistical management DP system,
 - c) the logistical management DP system compares the coordinates of the identification points against the data of the container being loaded as stored in the DP system and determines the fastening means to be assigned to this container and position coordinates on the loading platform of the transport vehicle,
 - d) the stacker crane drives under computer control with the container to be loaded above the loading platform of the transport vehicle, exactly congruent and above the position coordinate,
 - e) by means of a calibrated camera system arranged on the stacker crane, the fastening means of the loading platform are detected and the container is moved if necessary so that the fastening means of the container stand congruently above the coordinated fastening means of the loading platform,
 - f) the container is set down on the loading platform of the transport vehicle such that the fastening means of the container and the coordinated fastening means of the loading platform mate together at the end of the setdown process.

2. Method for load transfer in a container storage space for standard containers, with a stacker crane for the containers servicing the container storage space, controllable by a DP system of a logistical management, which can travel between a storage place for each container and a loading platform of a transport vehicle of a container that can travel in the area of the container storage space, wherein the stacker crane has a load suspension device for picking the container up from the loading platform, which can be oriented with respect to it,
characterized by the sequence of the following work steps in the unloading of a transport vehicle:
 - a) the transport vehicle and the container being unloaded are identified and the data generated in this way are transmitted to the DP system of a logistical management,

- b) by means of a calibrated camera system, defined identification points of the container are detected and their coordinates are transmitted to the logistical management DP system,
 - c) the logistical management DP system determines, from the identification points, the fastening means and position coordinate of the container,
 - d) the stacker crane drives under computer control above the container, exactly congruent and above the position coordinate,
 - e) by means of a calibrated camera system arranged on the stacker crane, the fastening means of the loading platform of the container are detected and the load suspension device is moved if necessary so that the fastening means of the load suspension device of the stacker crane stand congruently above the coordinated fastening means of the container,
 - f) the load suspension means is brought up to the container such that the fastening means of the load suspension means and the fastening means of the container mate together.
3. Method per claim 1 or 2, characterized in that the transport vehicle or the container being unloaded is identified by means of a camera system.
 4. Method according to one of claims 1 to 3, characterized in that, in order to detect the coordinates of the identification points of the loading platform or the identification points of the container, an operator, supported by a user-defined interface on a monitor screen of the logistical management DP system, uses a marking mechanism to select the identification points of the loading platform or the identification points of the container on the user-defined interface.
 5. Method according to one of claims 1 to 4, characterized in that the coordinates of the identification points of the loading platform or the identification points of the container are automatically detected by a computer system and transmitted to the logistical management.
 6. Method according to one of claims 1 to 5, characterized in that the detection of the coordinates of the loading platform of the transport vehicle occurs in its loading and unloading zone and that of the coordinates of the loading platform of the container occurs in its loading and unloading zone.
 7. Method according to one of claims 1 to 5, characterized in that the position coordinates are described by the vertical position of the loading platform and by the point of intersection of the diagonals of the identification points of the loading platform, which describe the absolute target position of the container, or by the vertical position of the upper edge of the identification points of the container and by the point of intersection of the diagonals of the identification points of the container, which describe the absolute target position of the load suspension means.

8. Method according to one of claims 1 to 6, characterized in that detection of the coordinates of the loading platform of the transport vehicle or the coordinates of the container occurs in the identification zone.
9. Method according to one of claims 1 to 8, characterized in that the vertical position of the loading platform and the point of intersection of the diagonals of the identification points of the loading platform or the vertical position of the upper edge of the identification points of the container and the point of intersection of the diagonals of the identification points of the container describe the relative target position of the container.
10. Method according to one of claims 1 to 9, characterized in that the position coordinate is described by the absolute target position of the container or of the load suspension device, which is composed of the coordinates of the transport vehicle located in the parking position as detected by means of a camera and the relative target position of the container or of the load suspension device.
11. Method according to one of claims 1 to 10, characterized in that the stacker crane is moved into reach of the loading platform or of the container in such a way that the point of intersection of the diagonals of the fastening means of the container or the load suspension device stands congruently plumb above the point of intersection of the diagonals of the fastening means of the loading platform or the container.
12. Method according to one of claims 1 to 11, characterized in that a second user-defined interface has four quadrants, each representing a pair of fastening means, and each pair consists of one fastening means of the loading platform or of the container, projected by an image of the camera system, and of the coordinated fastening means of the container or the load suspension device, projected by a superimposing of a computer-calculated contour of the container or of the load suspension means and of the fastening means of the container or of the load suspension means, onto the image.
13. Method according to one of claims 1 to 12, characterized in that any deviation in position of the container being loaded from the position of the loading platform or the position of the load suspension device from the position of the container being unloaded can be determined in the logistical management DP system for a fine-tuned positioning, in that the second user-defined interface of logistical management has a marking mechanism, with which the operator selects at least one identification point of the loading platform or of the container.
14. Method according to one of claims 1 to 13, characterized in that any deviation in position of the container being loaded from the position of the loading platform or in the position of the load

suspension device from the position of the container being unloaded is automatically recognized by a computer system for the fine positioning.

15. Method according to one of claims 1 to 14, characterized in that, if there is any deviation in position of the container being loaded from the position of the loading platform of the container or in the position of the load suspension device from the container being unloaded, the load suspension device is rotated so that the fastening means of the container stand congruently plumb above the fastening means of the loading platform, or the fastening means of the load suspension device stand congruently plumb above the fastening means of the container.
16. Method according to one of claims 1 to 15, characterized in that the setting down and releasing of the container from the load suspension device or the setting down of the load suspension device of the stacker crane onto the container is guided by the operator until the fastening means mate with each other.
17. Method for adjusting the position of a stacker crane in a container storage space, to implement the method according to one or more of claims 1 or 2, as well as 3 to 16, with a camera system fastened on the stacker crane for detection of the position of containers being handled, with an absolute length measuring system to detect the position of the stacker crane, characterized by the sequence of the following work steps, making use of precalibrated cameras:
 - a) the stacker crane travels above a reference point arranged at any given position within the container yard, so that at least one camera of the camera system detects the reference point,
 - b) the logistical management DP system compares the position of the reference point with the memorized position of the reference point and determines an offset when any deviation exists.
18. Method per claim 17, characterized in that the container yard has several reference points, which can be detected by the cameras of the stacker crane.
19. Method for adjusting the position of a camera, which is arranged on a stacker crane, which is located in a container yard, for implementing the method according to one or more of claims 1 or 2, as well as 3 to 16, with a camera system fastened to the stacker crane for detecting the position of containers being handled, with an absolute length measuring system for detecting the position of the stacker crane, characterized in that the container yard has a super-reference point and a camera is arranged on the stacker crane that can be adjusted relative to it by means of the super-reference point.